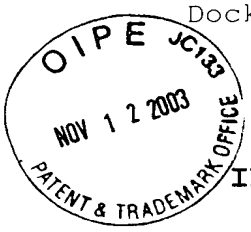
Docket No. 10014774-1 PATENT



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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants: **ARLEN L. ROESNER, et al.**	
Serial No.: **10/017,543**	Examiner: **Boris L. Chervinsky**
Filed: **December 13, 2001**	Art Unit: **2835**
Title: **THERMAL INTERFACE**	Confirmation No. **8101**

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Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

RESPONSE TO OFFICE ACTION

Sir:

In response to the Office Action dated October 9, 2003, consideration of the following remarks is respectfully requested.

Claims 1-30, of which claims 1, 10 and 22 are independent, are in the application.

This application is back before the Examiner following a decision by the Board of Appeals reversing the final rejections based on the Green, Tzeng and Lee references.

The Board made the following findings, among others:

1. That the composition containing phase-changing alkyl substituted poly (hydro, methyl-siloxane) wax polymers taught by Green is solely a "phase-change material" and not a "pliable, thermal compound"; and

2. That Green does not disclose the elements of a thermal interface arranged as specified in appealed independent claims 1, 10 and 12. (Decision on Appeal dated June 30, 2003, p.3)

Declining to exercise its authority under 37 CFR §1.196(b), the Board instead suggested that:

> ...the examiner consider whether one of ordinary skill in this art would have found in the prior art the reasonable suggestion to modify the thermal interface structures disclosed by Green and any other reference(s) developed by the examiner, such as United States Patent 5,912,805 which is described by appellants to disclose a double 'phase-change material' sided thermal interface structure (see specification, page 2), by adding a 'pliable, thermal compound' as a layer on the opposite side of a substrate from a 'phase-change material' in a single 'phase-change material' sided thermal interface (see Green, col. 1, lines 53-55), or by interchanging a 'phase-change material' layer with a 'pliable, thermal compound' in a double 'phase-change material' sided thermal interface structure, in the reasonable expectation of obtaining a double sided structure useful as a thermal interface. (Dec. on Appeal, p. 5.)

In response to the Board's suggestion, the Examiner has now cited Brzezinski U.S. Patent No. 5,608,610 apparently for a purported suggestion to modify the double-sided phase-change material thermal interface structure of Fig. 4 of Green by substituting a pliable, thermal compound material layer for one of the phase-change material layers in Green.

The Rejections and Applicants' Arguments

a. Independent claims 1 and 22, along with dependent claims 2-9 and 23-30 stand rejected under 35 U.S.C. 103(a) as unpatentable over Green in view of Brzezinski. This rejection is respectfully traversed.

Claim 1 sets forth a thermal interface comprising:

> a carrier having opposed surfaces;
> a layer of a phase-change material on one of the surfaces of the carrier; and
> a layer of a pliable, thermal compound on the other of the surfaces of the carrier.

The Board interpreted certain of the language of this claim. (Dec. on Appeal, page 2.) In addition, the term "layer"

means a "thin film". (*See*, specification, page 1, lines 16-19.)

Claim 22 provides an assembly comprising a substrate, an electronic component mounted on the substrate, a heat sink, and a thermal interface as described above interposed between a surface of the electronic component and a confronting surface of the heat sink for transferring heat generated by the electronic component to the heat sink.

Green's contribution is a specific dry film, phase-change material formulation, namely, a thermally stable wax formed as an alkyl substituted poly (hydro, methyl-siloxane) wax polymer. Green discloses in Figs. 1A, 1B, 2 and 3, various devices incorporating a single coating of Green's dry film composition. In Fig. 4, Green discloses an interface member 43 comprising a metal foil substrate 44 coated on both sides with identical layers 45 and 46 of Green's dry film, phase-change composition. None of the devices disclosed by Green employ silicon grease, the undesirability of which Green describes as follows:

> In the course of a typical assembly operation prior to the present invention, silicone grease, for example, was applied liberally to the surfaces so as to assure its presence in all of these locations where it is reasonably expected to be needed or required. As a result, the assembly operations utilizing grease typically over-apply the material, and the products become messy, with the grease in certain instances, interfering with subsequent assembly operations and also with subsequent operation of the solid state device. Under application has also presented some problems, particularly regarding performance consistency. The features of the present invention provide a highly thermally conductive coating which may be applied to surfaces along a thermal path, with the coating having a consistent and uniform thickness which contributes to consistency in performance. Given this property in the thermally conductive coating, greater predictability of performance is available from the semiconductor devices utilized in combination with the coating, with these advantages being obtained without experiencing the problems inherent in applications of silicone grease." (Green, col. 2, lines 41-61.)

Brzezinsky discloses in Fig. 1 a dual heat sink, "floating" multi-chip module 10 that encloses a flexible, conformable, leak-proof metallic membrane 56 one side of which bears against the passive sides of chips 28-38 in a first chamber 24. A synthetic thermal grease may be used to coat the passive sides of the chips 28-38. (Brzezinski, 7/12-16.) The other side of the membrane 56 faces a second chamber charged with a volume of thermally conductive liquid 58. Various liquids are disclosed, including distilled water with ten percent ethylene glycol (6/29-31); a synthetic Freon (6/36-37); and "phase-change salts which quickly give up energy when caused to boil" (6/33-35).

The Examiner apparently finds in the Green and Brzezinski references a suggestion to modify the thermal interface structure of Fig. 4 of Green by substituting for one of the dry film phase-change coatings 45 and 46 in Fig. 4 a layer of a pliable, thermal compound. Applicants respectfully disagree that such a suggestion can be extracted from the applied references. Given the disparate teachings of the references, it is anything but clear just how one ordinarily skilled in the art having these two references before him would go about combining them in any rational manner, let alone in the way that is apparently being urged by the Examiner. It bears repeating that both the suggestion of the modification and the reasonable expectation of success must be found in the prior art and not in the applicant's disclosure. In re Vaeck, 947 F.2d 488, 20 USPQ2d 1438 (Fed.Cir. 1991).

Brzezinski's thermal management scheme is substantially different than that of Green's. On one side of the conformable membrane in Brzezinski is a chamber or cavity charged with a working fluid, preferably distilled water because of its chemical compatibility and its high latent heat. Brzezinski alternatively proposes to fill the second chamber with "phase-

change salts which *quickly give up energy when caused to boil*". It is thus clear that here Brzezinski uses the latent heat of vaporization to extract heat from the multi-chip module. Nothing remotely similar is involved in Green.

At bottom, in support of this rejection, the Examiner, seizing upon the "phase-change" language in Brzezinski, has simply extracted the grease coating from Brzezinski and, having removed it from the context of Brzezinski's evaporative cooling system, concludes that it would have been obvious to substitute that coating for one of the dry film phase-change coatings in Green. But the cited art fails to suggest such a modification, and the Examiner has not identified any such teaching that, in fact, can only be found by recourse to the applicants' disclosure.

The reasons given by the Examiner in support of the purported obviousness of modifying Green in view of Brzezinski (Office Action, p. 3) are not persuasive. Reason (a), that grease coatings are well known may be true but, as noted above, Green explains in detail why such coatings are to be avoided; the fact is that Green clearly teaches away from the use of such a material. There is nothing in these references that would encourage or motivate a skilled worker to substitute the grease coating mentioned in Brzezinski for one of the dry film phase change coatings in Green; there is no teaching in favor of it, but there is a cogent teaching against it. With respect to the Examiner's reasons (b)-(d), these are not based on anything in the cited references.

In summary, applicants respectfully submit that the attempted combination amounts to a prohibited hindsight reconstruction. In re Bond, 910 F.2d 831, 15 USPQ2d 1566 (Fed. Cir. 1990).

In view of the foregoing, it is submitted that independent claims 1 and 22, as well as claims 2-9 and 23-30

that depend therefrom, are patentable over the applied references.

b. Independent claim 10 and dependent claims 11 and 13-21 stand rejected under Section 103(a) as unpatentable over Green in view of Brzezinski further in view of Tzeng. This rejection is also respectfully traversed.

Independent claim 10 sets forth a thermal interface product comprising the thermal interface described in claim 1 further in combination with "a removable protective covering overlying the pliable, thermal compound layer".

Applicants' earlier remarks regarding the patentability of independent claims 1 and 22 over Green in view of Brzezinski are applicable to the rejection of claim 10.

The Tzeng patent relates to a release-lined, pressure sensitive adhesive, flexible graphite thermal interface sheet. The Tzeng interface sheet comprises a flexible graphite substrate 11, an adhesive primer coating 12 on the substrate, a pressure sensitive adhesive coating 13 on the primer coating and a release liner 14 on the pressure sensitive adhesive coating. The release liner 14 is said to be easily removed without any significant delamination of the flexible graphite substrate. (Tzeng, 2/3-9.)

In an effort to meet the limitations of claim 10, the Examiner, at page 4 of the Office Action, has inadequately described the coating 13 in the Tzeng reference. The coating is not simply a "pressure sensitive layer" as described by the Examiner, but a "PSA coating", that is, a pressure sensitive adhesive coating. (For example, Tzeng, 6/23-24.) There is nothing in any of the references to suggest to one skilled in the art that the release liner 14 which overlies the pressure sensitive adhesive coating in the Tzeng reference should be used to cover a layer of pliable, thermal compound such as silicone grease which is virtually the antithesis of an

adhesive. Thus, the Examiner is incorrect in his assertion that "it would have been obvious at the time the invention was made to a person having ordinary skill in the art to use removable protective layer as disclosed by Tzeng in the structure disclosed by Green as to protect the pliable thermal compound layer prior to installation". (Office Action, page 3.) The Examiner has not pointed to any part of either of the references to support that statement and, indeed, cannot do so. The Examiner has simply seized upon the presence of a release liner in Tzeng and transferred that element -- divorced from its context -- to the Green reference, again, an improper hindsight reconstruction.

Accordingly, the rejections of independent claim 10 and claims 11 and 13-21 depending therefrom, should be withdrawn.

c. Dependent claim 12 stands rejected under Section 103(a) as unpatentable over Green in view of Brzezinski further in view of Tzeng and Lee. This rejection is also respectfully traversed.

Claim 12 depends from claim 10. Accordingly, the comments made concerning the patentability of claim 10 over Green in view of Brzezinski and Tzeng are equally applicable to claim 12.

Dependent claim 12 further defines the "removable protective covering" set forth in claim 10 as comprising "a cap removably attached to the carrier". The rejection of claim 12 adds to Green, Brzezinski and Tzeng a fourth reference, the Lee patent.

Lee discloses a heat sink 30 for dissipating heat generated by a CPU. The heat sink includes a base 31, heat dissipating fins 32 projecting from the base and a layer of thermal grease 40 spread on a middle portion of the heat sink base. A protective cap 50 is removably attached to the base to enclose the thermal grease so that the grease will not cause

contamination during transportation or handling of the heat sink. (Lee, 2/31-35.)

The inadequacy of the rejection of claim 12 is made manifest by the fact that the Examiner has made no attempt to show how the references can be combined in any rational way. The Examiner's statement that "[i]t would have been obvious...to have the protective removable cap as disclosed by Lee et al. in the device disclosed by Green et al. in order to protect pliable surface or thermal grease", is a conclusion having no support whatever in the applied art. Once again, it is submitted that the Examiner has simply extracted an element from the prior art and used the claims in issue themselves as a road map in an attempt to come up with the claimed combination -- again, a classical example of a hindsight reconstruction.

The rejection of claim 12 should be withdrawn.

Conclusion

In light of the foregoing, it is respectfully submitted that claims 1-30 are patentable over the prior art. Accordingly, reconsideration of those claims and withdrawal of the rejections thereof are respectfully requested.

Respectfully submitted,

Dated: November 11, 2003

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